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CORAL-INHABITING CRABS OF THE FAMILY
HAPALOCARCINIDAE FROM JAPAN

VII. GENUS *FAVICOLA*¹⁾

With 3 Text-figures and 3 Plates

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日本産サンゴヤドリガニ類

VII. キクメイシヤドリガニ属 (新称)

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The genus *Favicola* was originally erected as the subgenus of the genus *Troglocarcinus* VERRILL by FIZE and SERÈNE (1957) to accomodate two new species and three known species referred to the genus *Cryptochirus* HELLER by EDMONDSON (1933). These five representatives of the genus *Favicola* are extremely close to the *Cryptochirus* species, and really impossible to be separated from them only by the differences in the external appearance. However, the females of *Favicola* have the biramous first and the uniramous second and third pleopods contrary to three uniramous pairs in the females of *Cryptochirus*. Thus, at present, the difference in the female pleopods is only the character to separate the two genera. Although the exopods of the female pleopods in the Hapalocarcinidae may be retrogressive as suggested by MCCAIN and COLES (1979), the genus *Favicola* is retained in the present paper following SERÈNE (1962).

It must be also noted that both sexes of the *Favicola* species enlodge in the cylindrical pits on the massive corals of the family Faviidae just like the *Cryptochirus* species.

In the present paper three species are recorded from the Ryukyu and Ogasawara Islands. They are *F. rugosa* (EDMONDSON), *F. helleri* (FIZE et SERÈNE) and *F. japonica*

1) This study is supported by the Grants-in-aid for Scientific Research from the Ministry of Education, Nos. 064206 and 334035.

sp. nov., the first of which is the type-species. All the specimens dealt herewith are preserved in the National Science Museum, Tokyo (NSMT).

Genus *Favicola* FIZE et SERÈNE, 1957

Troglocarcinus (*Favicola*) FIZE and SERÈNE, 1957, p. 84.

Favicola: SERÈNE, 1966, p. 396.

Diagnosis. Carapace much longer than broad, subquadrangular and thickly covered with granules and setae; dorsum weakly convex in both directions, its anterior part being bent obliquely downward. Front more or less developed and fringed with several spinules. Meri of first to third ambulatory legs compressed. Female abdomen with three pairs of pleopods; the first biramous, with a rudimental exopod at its base, while the second and third are uniramous. Male abdomen elongate, with seven segments.

Type-species. *Cryptochirus rugosus* EDMONDSON, 1933.

Remarks. The feature of the female pleopods has been treated as one of the important criteria to distinguish the genera in the family Hapalocarcinidae. As for the genus *Favicola*, as stated elsewhere, this character is especially important, and may be the only one to separate it from the genus *Cryptochirus*. It must be noted that MCCAIN and COLES (1979) suggested the rudimental exopods of the female pleopods in the Hapalocarcinidae as the retrogressive organ for its instability. According to them, some specimens from the Hawaiian Islands referred to *Hapalocarcinus marsupialis* STIMPSON and *Pseudohapalocarcinus ransoni* FIZE et SERÈNE, both of which are the gall-forming species, were found to have the biramous pleopods of different number from the typical specimens. In the present paper, however, we adopt rather tentatively the precedent system, for the female pleopods of the three species dealt herewith are stable in the number of the biramous pleopods.

A tentative key to all the six species of the genus was prepared.

Key to the species of *Favicola* based on adult females

1. Posterior median part of gastric region prominently convex dorsally and separated from other parts by deep furrows 2
- Posterior median part of gastric region evenly convex and nearly confluent with other parts..... 4
2. Posterior median part of gastric region hemispherical, its breadth being more than 1/3 of carapace breadth. Chelipeds rather slender *F. rugosa* (EDMONDSON)
- Posterior median part of gastric region narrow, its breadth being less than 1/3 of carapace breadth 3
3. Antero-lateral furrow of gastric region prominently deep
..... *F. helleri* (FIZE et SERÈNE)

- Anterior part of carapace without deep furrow *F. verrilli* (FIZE et SERÈNE)
- 4. Anterior part of carapace flattened..... *F. pyriformis* (EDMONDSON)
- Anterior part of carapace with furrows or depressions 5
- 5. Internal orbital angle protruded beyond external orbital angle. Anterior part of carapace with a pair of broad oval depressions..... *F. minuta* (EDMONDSON)
- External orbital angle protruded beyond internal orbital angle. Anterior part of gastric region with a Λ -shaped narrow furrow..... *F. japonica* sp. nov.

***Favicola rugosa* (EDMONDSON, 1933)**

(Text-fig. 1; Plate 1)

Cryptochirus rugosus EDMONDSON, 1933, p. 6, fig. 1, pl. 1.

Troglocarcinus rugosus: FIZE and SERÈNE, 1955, p. 381.

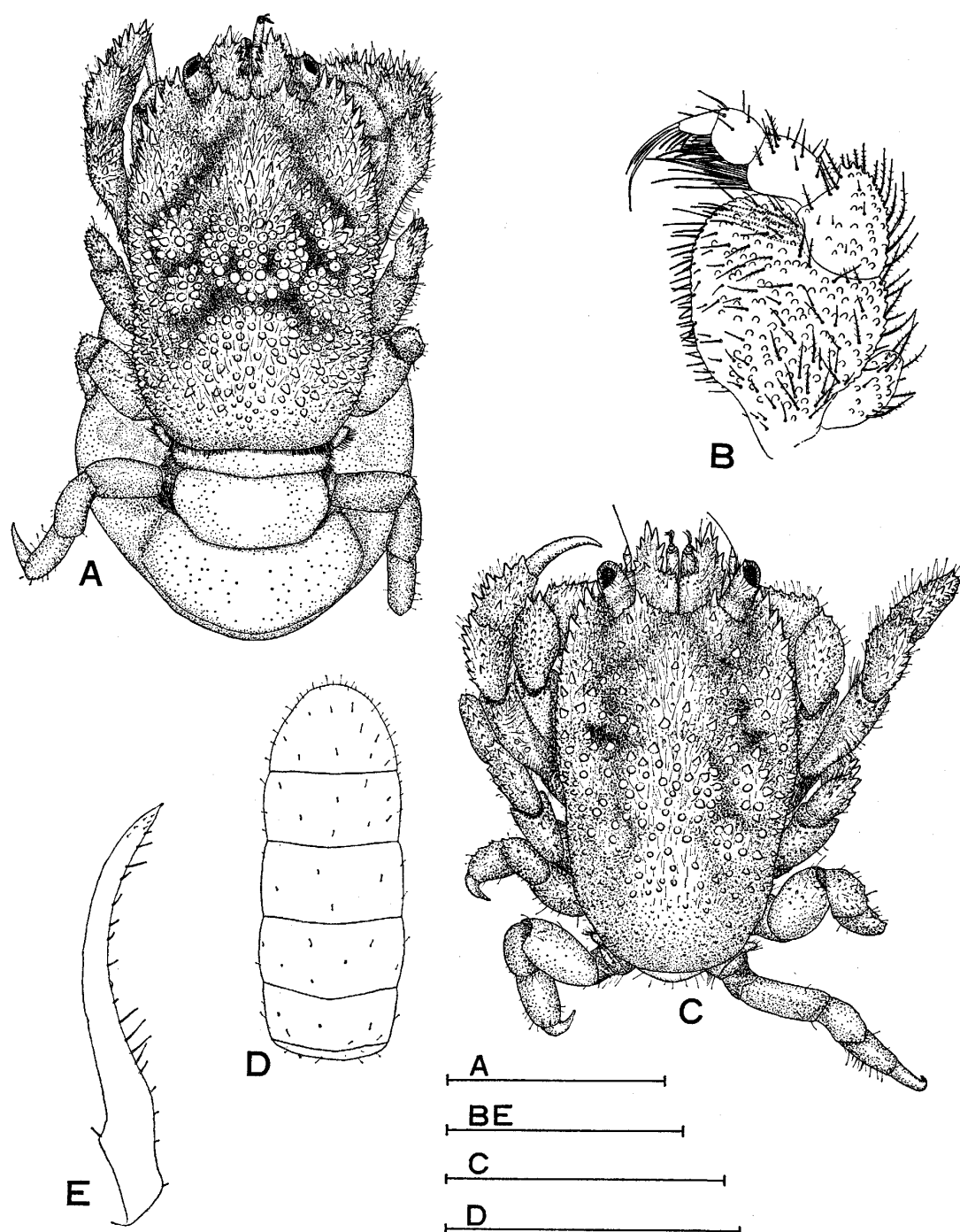
Troglocarcinus (Favicola) rugosus: FIZE and SERÈNE, 1957, p. 85, figs. 21, 22, 23(A), 25(A), 27(A-C), pls. 5(7), 6(1-3), 10(D, E); SERÈNE, 1962, p. 30, figs. 1(c, d), 2(c, d), 5(A, a).

Favicola rugosus: SERÈNE, 1966, p. 397 (in list).

Description. Female. Carapace moderately convex as a whole and thickly covered with short setae and conical granules of various size which are prominent on antero-lateral border and median part of dorsum. Gastric region convex dorsally and restricted anterolaterally by an oblique furrow at each side; anterior part of gastric region pointed anteriorly, while posterior part is hemispherical, with dense large granules and two small cavities at submedian part, and restricted laterally and posteriorly by a deep furrow. Hepatic region separated posterolaterally from gastric and branchial regions by an oblique deep furrow. Branchial region subdivided into three parts by two oblique, deep furrows; anterior two parts are ridge-like, with dense large granules. Cardio-intestinal region not separated from posterior part of each branchial region, being covered with granules which are small on posterior part.

Front moderately concave and armed with spinules; internal orbital angle tipped with a spine and not protruded beyond external orbital angle. Front-orbital border a little shorter than posterior border of carapace and about $2/3$ the greatest breadth of carapace. Supraorbital border deeply excavated to be V, eyestalk being visible from above. Basal segment of antennule well developed and exceeded beyond external orbital angle and eyestalk, being armed with several spinules along margins and on upper surface. Anterolateral part of carapace armed with a series of several large spines. Third maxilliped as figured.

Both chelipeds rather slender and equal in size and shape; merus along its upper border nearly as long as twice its height, and upper and lower surfaces covered with longish setae and minute granules; palm along its upper border a little longer than its height, but shorter than movable finger; fingers entire on cutting edges and leave a



Text-fig. 1. *Favicola rugosa* (EDMONDSON), ovig. ♀, NSMT-Cr 7416-1 (figs. A, B) and ♂, NSMT-Cr 7418-2 (figs. C-E). A and C, entire animal; B, left third maxilliped; D, distal six segments of abdomen; E, left first pleopod in ventral view. Scales for A and C=3 mm, for B and E=1 mm, for D=2 mm.

short gape proximally.

First ambulatory leg longer and stouter than cheliped; both borders of merus and upper borders of carpus and propodus fringed with dense longish setae and granules. Second leg shorter than the first and generally resembles the first. Third leg the shortest. Fourth leg a little shorter than the first and almost cylindrical with sparse short setae.

Male. Smaller than female. Dorsum more sparsely covered with granules, and regions more indistinctly demarcated. Both chelipeds equal in size and comparatively stouter than those of female. Abdomen elongate and composed of seven segments, only the first being visible in dorsal view. First pleopod rather slender and fringed with sparse longish setae at its external surface.

Material examined. Twelve ovigerous females (NSMT-Cr 6705-1~3, 7410~7418-1, $3.2 \times 5.1 \sim 4.8 \times 7.6$ mm), three females (NSMT-Cr 7416-2, 3, 7417; $2.3 \times 3.6 \sim 5.1 \times 7.9$ mm) and three males (NSMT-Cr 7415-3, 7416-4, 7418-2; $2.7 \times 4.5 \sim 3.1 \times 5.2$ mm) were collected at Kuro-shima, Ishigaki-jima and Okinawa-jima Islands in the Ryukyu Islands, Chichi-jima Island in the Ogasawara Islands, and Cape Muroto of Kochi Prefecture by the present authors, Mr. A. KOJIMA and Mr. T. FUKUDA. The specimens collected from one coral block were registered with one stem number. Three specimens (NSMT-Cr 6705-1~3) were collected together with four *Cryptochirus coralliodytes* (NSMT-Cr 6704-1~4) from one coral block (refer the photographs in TAKEDA and TAMURA, 1980).

Host coral. The host coral recorded by the original author is *Favia speciosa* (DANA) [Jap. name: Kikumeishi]. Afterward, FIZE and SERÈNE (1957) collected the specimens from *Goniastrea aspera* VERRILL [Toge-kamenokou-kikumeishi] and *G. quoyi* (M. EDWARDS et HAIME), *Platygyra lamellina* (EHRENBERG) [Nou-sango], *P. stricta* (M. EDWARDS et HAIME) and *P. daedalea* (ELLIS et SOLANDER). All the host corals recorded belong to the family Faviidae. The specimens at our hands were also collected from some unidentified species of the same family.

The opening of the pit is always circular, and its diameter is shorter than 1.5 times the carapace breadth. The pit is not deep, being about 4 times the carapace length in the largest case among the present specimens.

Remarks. This species is readily distinguished from the other species of the genus by the different sculpture of the dorsum. It is, however, sometimes difficult to separate this species at a glance from some specimens of *Cryptochirus coralliodytes*, because the latter species is remarkably variable in its extent of the sculpture of the dorsum, and thus the individuals with rather deep furrows are generally close to the present species in the external appearance.

Distribution. Hitherto known from Washington Island (EDMONDSON, 1933), Palmyra and Rarotonga Islands (SERÈNE, 1962), and Nhatrang, Viet-Nam (FIZE and SERÈNE, 1957).

Favicola helleri (FIZE et SERÈNE, 1957)

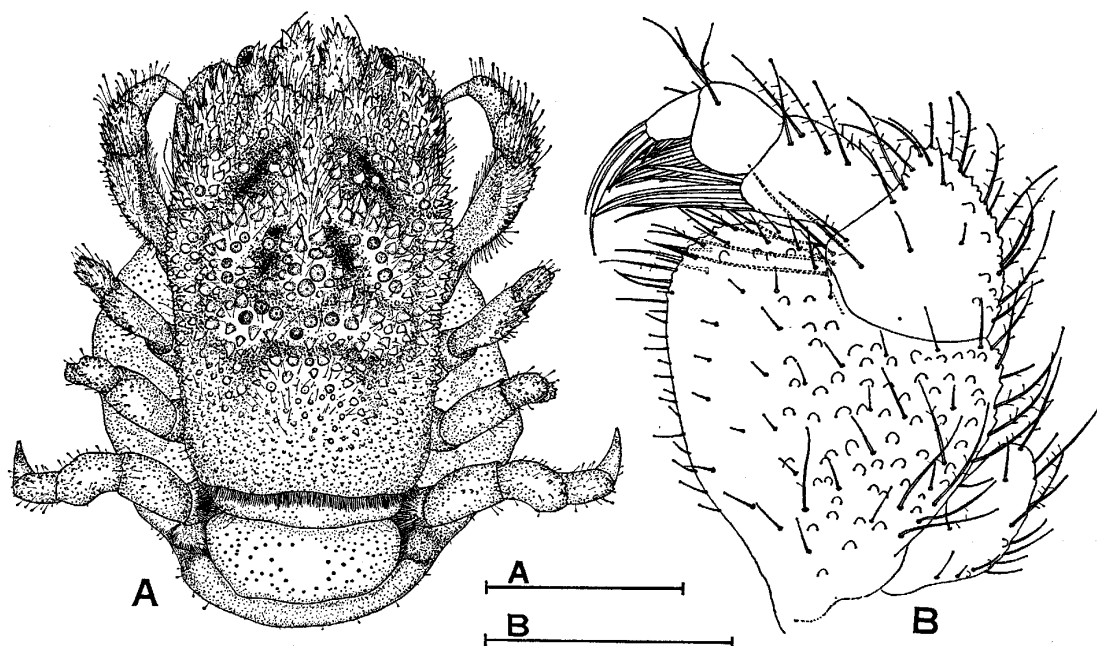
(Text-fig. 2; Pl. 2, figs. A, B)

Troglocarcinus (*Favicola*) *helleri* FIZE and SERÈNE, 1957, p. 93, figs. 23(B), 24, 25(B), 27(D, E), 28(A), pls. 5(8, 9), 6(4-9), 10(F), 16(E-G); SERÈNE, 1962, p. 30, figs. 1(e), 2(e), 5(B, b).

Favicola helleri: SERÈNE, 1966, p. 397 (in list).

Description. Female. General appearance of carapace close to that of *F. rugosa*. Anterior part of gastric region separated anterolaterally from hepatic region by a deep furrow at each side, but anterior end not distinctly delimited from frontal region; median part of gastric region suboval and partially separated from branchial region by a short, deep furrow at each side, but anteriorly not separated from anterior part of gastric region; posterior part of gastric region confluent laterally with branchial regions at both sides, forming a long transverse swell which is surrounded by a furrow. Anterior half of branchial region separated into inner and outer parts by a longitudinal furrow originated from anterolateral furrow of anterior part of gastric region; inner part of branchial region subdivided into two parts by an oblique furrow; anterior sub-region is next the anterior part of gastric region and posterior sub-region continuous with posterior part of gastric region. Cardio-intestinal region restricted anteriorly by a transverse furrow from branchial regions.

Formation of front-orbital region, chelipeds and ambulatory legs nearly identical



Text-fig. 2. *Favicola helleri* (FIZE et SERÈNE), ovig. ♀, NSMT-Cr 7419. A, entire animal; B, left third maxilliped. Scale for A=2 mm, for B=0.5 mm.

with that of *F. rugosa*, except for palm, upper border of which is as long as height of palm.

Material examined. Four ovigerous females (NSMT-Cr 7421, 3.3×5.3 mm; 7420-1, 3.2×4.9 mm; 7419, 3.0×4.5 mm; 7420-2, 2.9×4.5 mm) and one young female (NSMT-Cr 7420-3, 2.0×3.0 mm) were collected at Kuro-shima Island in the southern Ryukyu Islands. The specimen registered as NSMT-Cr 7419 was collected on September 20, 1975 by Mr. T. FUKUDA, and the others on April 12-19, 1976 by the senior author. The specimens with same stem number are those obtained from one coral block.

Host coral. The host coral recorded by the original authors are *Favia speciosa* (DANA) [Jap. name: Kikumeishi], *F. pallida* (DANA) [Hime-kikumeishi] and *F. valenciennesi* (M. EDWARDS et HAIME), *Favites abdita* (ELLIS et SOLANDER) [Kamenokou-kikumeishi], *F. pentagona* (ESPER) [Gokaku-kikumeishi], *F. flexiosa* (DANA) [Futoune-kamenokou-kikumeishi] and *Montastrea cacua* CROSSLAND. They belong to the family Faviidae, and the specimens from the Ryukyu Islands were also obtained from an unidentified species of *Goniastrea* of the same family.

The nature of the pit is also nearly identical with the case of *F. rugosa*. In the largest case among the present specimens the depth of the pit is 2.5 times the carapace length of the dweller.

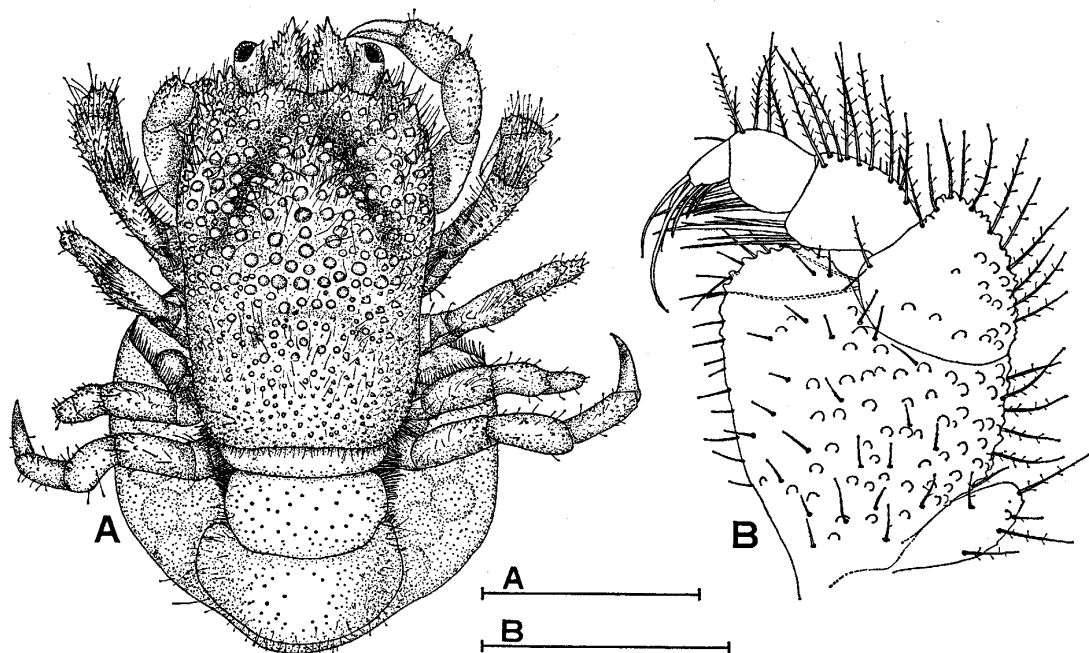
Distribution. Hitherto known from Nhatrang, Viet-Nam (FIZE and SERÈNE, 1957), Washington Island (SERÈNE, 1962) and Sumatra, Indonesia (SERÈNE, 1966).

Favicola japonica sp. nov.

(Text-fig. 3; Pl. 2, figs. C, D)

Description of holotype. Carapace much longer than broad and subquadrangular, its anterior part being moderately declivous obliquely downward; dorsum moderately convex as a whole and covered with setae and granules of various size which are small on its posterior part. Gastric region convex dorsally, being restricted anterolaterally by an oblique furrow at each side; furrows of both sides combined to be Λ at anterior median part of gastric region behind the front; posterior ends of furrows reach to nearly half of carapace length. Cardio-intestinal region restricted anterolaterally only by a shallow furrow.

Front moderately concave and armed with spinules; internal orbital angle obtuse and not protruded beyond external orbital angle. Front-orbital border narrower than posterior border of carapace and about $3/5$ the greatest breadth of carapace. Supraorbital border deeply concave or rather notched and armed with spinules, eyestalk being visible from above. Basal segment of antennule well developed and exceeded beyond external orbital angle and eyestalk, being armed with several spinules along margins and on upper surface. Anterior part of lateral border of carapace armed with some



Text-fig. 3. *Favicola japonica* sp. nov., ovig. ♀, holotype, NSMT-Cr 7422. A, entire animal; B, left third maxilliped. Scale for A=2 mm, for B=0.5 mm.

large spines. Third maxilliped as figured.

Both chelipeds equal in size and shape, not stout; merus along its upper border shorter than twice its height, and its upper and lower surfaces covered with setae and minute granules; upper border of palm a little shorter than its height and movable finger; fingers entire on cutting edges and tips scarcely crossing each other.

First ambulatory leg longer and stouter than cheliped; both borders of merus and upper borders of carpus and propodus covered with dense longish setae and granules. Second leg shorter than the first and generally resemble the first. Third leg the shortest. Fourth leg a little shorter than the first, being almost cylindrical with sparse short setae.

Material examined. Two ovigerous females (holotype, NSMT-Cr 7422, 2.4×3.6 mm; paratype, 7423, 2.1×3.2 mm) were collected from one coral block at Kuro-shima Island in the southern Ryukyu Islands on September 20, 1975 by Mr. T. FUKUDA. Ten ovigerous females (paratypes, NSMT-Cr 7424-7433, 2.0×2.9~2.5×3.9 mm) were collected at Miyanohama, Chichi-jima Island in the Ogasawara Islands on July 1, 1976 by the senior author.

Host coral. The specimens from the Ryukyu Islands were collected from the unidentified species of *Goniastrea* of the family Faviidae.

Remarks. The new species is closely related to *F. minuta* (EDMONDSON)¹⁾ which

1) TAKEDA and TAMURA (1980) wrongly synonymized *Cryptochirus coralliodytes parvulus* FIZE et SERÈNE, 1957, with this species. True systematic status of this subspecies is not sure, but it is without doubt referred to *Cryptochirus*.

was recorded from Oahu Island by the original author and from Nhatrang, Viet-Nam by FIZE and SERÈNE (1957), but distinguished from it by the different nature of sculpture of the carapace. The holotype and paratypes were directly compared with two ovigerous females from Oahu Island which agree well with the original and subsequent descriptions.

In the new species the internal orbital angle does not extend beyond the external orbital angle and the anterior part of the carapace is marked by a Λ -shaped furrow delimited the gastric region. On the contrary, in *F. minuta* the internal orbital angle extends beyond the external orbital angle and the anterior part of the carapace is marked with two oval, longitudinal depressions behind each supraorbital border. Otherwise, in *F. minuta* the anterior part of the carapace around the depressions is covered with spinules, and the lateral surface of the carapace is rather distinctly constricted at the place between the hepatic and branchial regions.

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Mr. Teruo FUKUDA, the researcher in the Marine Park Research Center, and Mr. Akio KOJIMA, the amateur collector in Tokyo, kindly sent us some interesting specimens for study. The junior author's cordial thanks are due to Dr. Ryôsuke ISHIKAWA of the Tokyo Metropolitan University for giving him the opportunity for study.

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Explanation of Plates

Plate 1

Figs. A-D. *Favicola rugosa* (EDMONDSON). A, B, ovig. ♀ (NSMT-Cr 7415-2). Breadth 3.7 mm, length 5.1 mm. C, D, ♂ (NSMT-Cr 7418-2). Breadth 2.7 mm, length 4.5 mm.

Plate 2

Figs. A, B. *Favicola helleri* (FIZE et SERÈNE). Ovig. ♀ (NSMT-Cr 7420-1). Breadth 3.2 mm, length 4.9 mm.

Figs. C, D. *Favicola japonica* sp. nov. C, ovig. ♀, holotype (NSMT-Cr 7422). Breadth 2.4 mm, length 3.6 mm. D, ovig. ♀, paratype (NSMT-Cr 7423). Breadth 2.1 mm, length 3.2 mm.

Plate 3

Figs. A, B. Entrance (A) and vertical section (B) of a pit bored in the unidentified faviid coral. The inhabitant is a female (NSMT-Cr 7417) of *Favicola rugosa* (EDMONDSON).

Figs. C, D. Ovig. ♀ (NSMT-Cr 7420-2) of *Favicola helleri* (FIZE et SERÈNE) staying in the pit of *Goniastrea* sp.

摘 要

Favicola (キクメイシヤドリガニ属, 新称) は FIZE and SERÈNE (1957) により *Troglocarcinus* 属の亜属として設けられ, 5 種が知られている。形態, 生態とも *Cryptochirus* (ケブカサンゴヤドリガニ属) に酷似し, 外形だけでは区別することができない。ほとんど唯一ともいえる区別点は, *Favicola* の雌では 3 対の腹肢のうち第 1 腹肢に外枝があるのに対し, *Cryptochirus* では 3 対の腹肢すべてに外枝を欠いていることである。MCCAIN and COLES (1979) が, ハワイ産の *Hapalocarcinus marsupialis* STIMPSON (サンゴヤドリガニ) と *Pseudohapalocarcinus ransonii* FIZE et SERÈNE (ヒメサンゴヤドリガニ) において二叉型腹肢の数が必ずしも一定していないことを報告しており, *Favicola* と *Cryptochirus* を雌の腹肢の状態によってのみ区別することは問題があるかもしれないが, 本報告で扱った標本では雌の腹肢は安定しており, 属名は *Favicola* を生かした。問題となった種はいずれも瘤を作る種であり, 穿孔性の種よりも形態の上でも特殊化が進んでいることが推察される。

本報告では *F. rugosa* (EDMONDSON) (キクメイシヤドリガニ, 新称), *F. helleri* (FIZE et SERÈNE) (ヤエヤマキクメイシヤドリガニ, 新称) の 2 既知種と *F. japonica* sp. nov. (ヤマトキクメイシヤドリガニ, 新種新称) を記録し, 新種を含めた全 6 種に対する検索表を作成した。

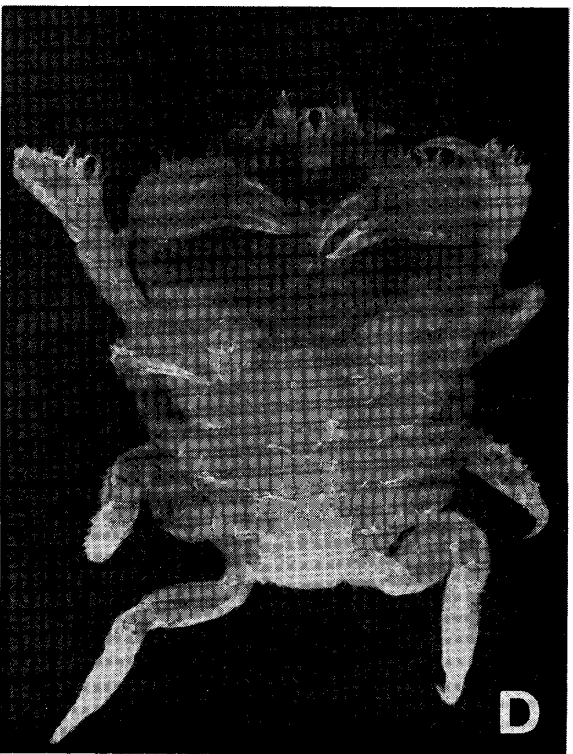
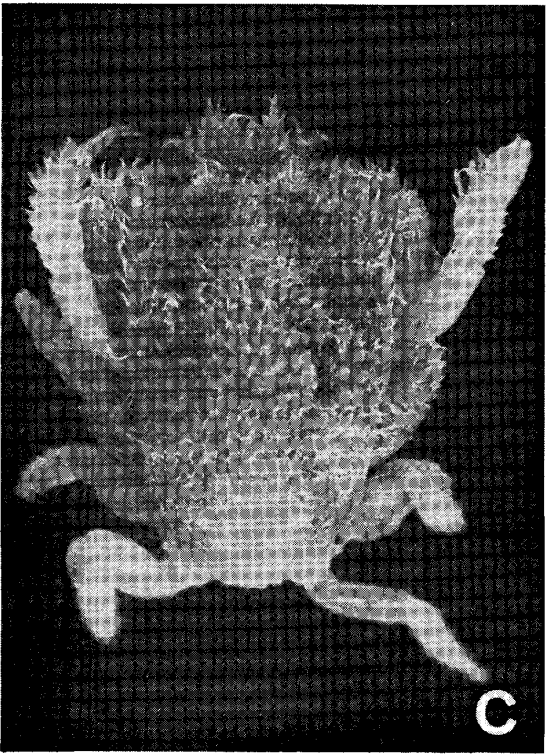
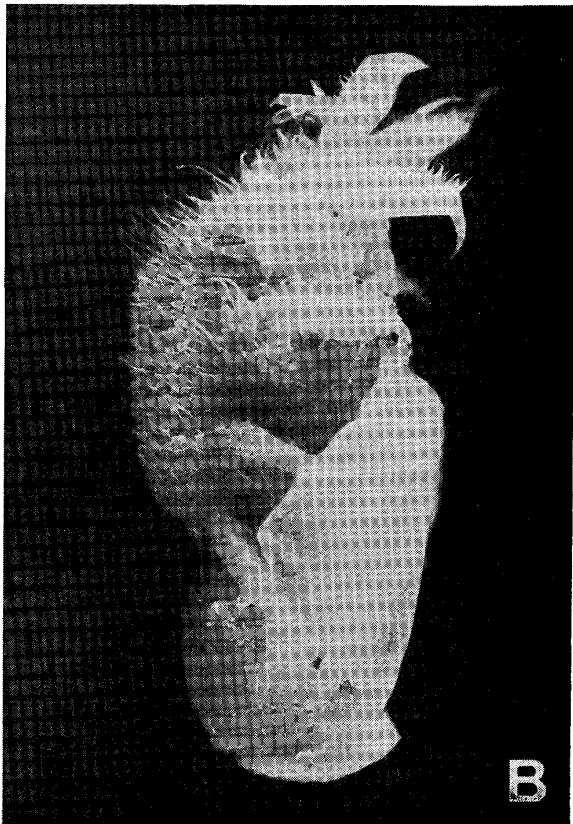
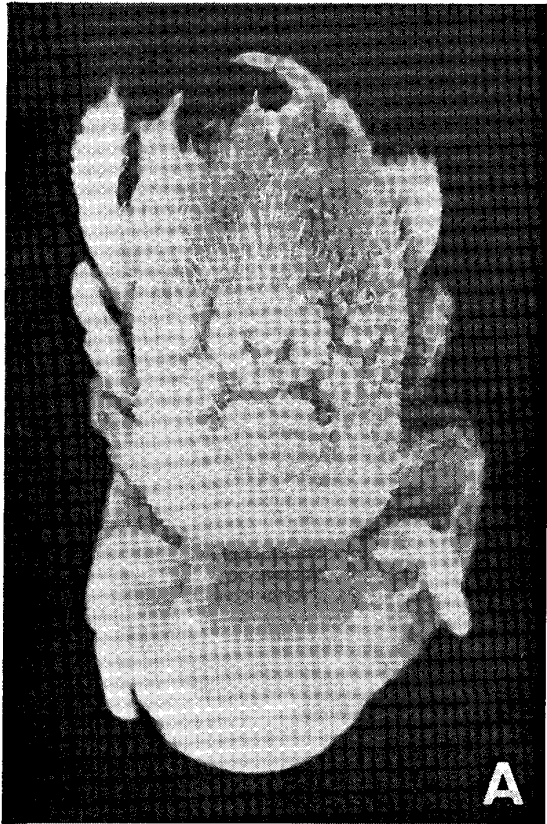


Plate 2

